Quality is more than a word

ESPEC

Thermal Shock Chamber

TSD-101-W
TSE-12-A

CAT.No.E16133-Z1609

Two-zone chamber capable of exposing specimens to a uniform thermal stress.

These two-zone thermal shock chambers are designed to specifically meet the needs of MIL, IEC, JASO, and other international testing standards.
Choose either the TSD model with 100L capacity, or the compact TSE model for small-volume testing.
They come mounted with The N-instrumentation for improved operability and visibility, making remote monitoring and control via an Ethernet connection possible from your desk.
Thermal shock chambers that apply uniform levels of thermal stress to specimens and that can be used in a wide range of fields, from research and development through to inspections and production.

TSD-101-W

TSE-12-A

*The viewing window, casters (TSD) and recorder, emergency stop pushbutton (TSE) are optional.

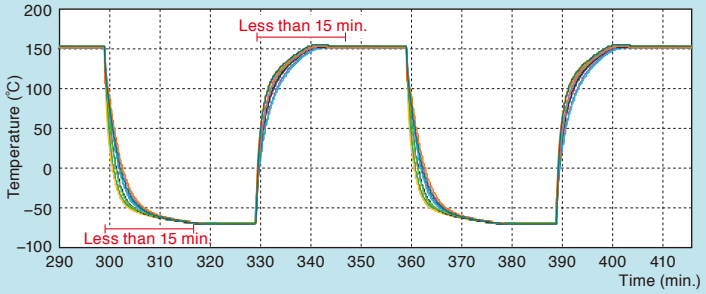
Features

Reduce test time with a two-zone elevator type

TSD specimen temperature recovery example
(based on MIL-STD-883 condition C)

Test conditions
Hot exposure: +150℃ for 30 min.
Cold exposure: −65℃ for 30 min.
Specimens: ICs, 10 kg

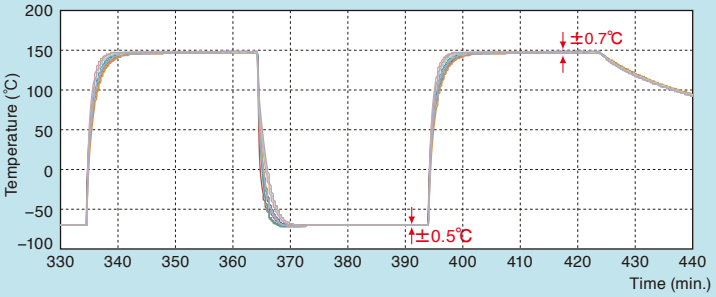
Measurement conditions
Thermocouples were embedded in 10 ICs placed on two two levels in each corner and in the center of a specimen basket.
(Specimens embedded with thermocouples were placed beneath other ICs.)



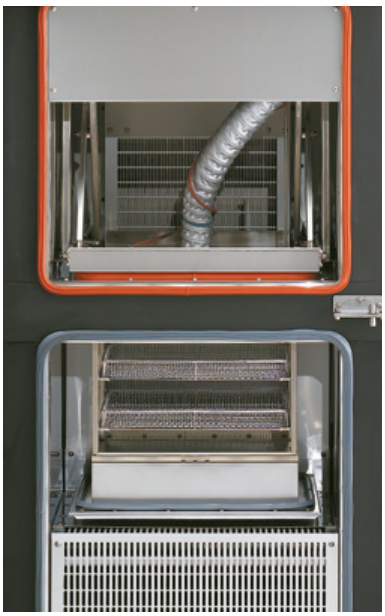
TSD temperature uniformity example

Test conditions
Hot exposure: +150℃ for 30 min.
Cold exposure: −65℃ for 30 min.
Specimens: ICs (×10)

Measurement conditions
Thermocouples were attached to the surface of 10 ICs placed on two levels in each corners and in the center of a specimen basket.




TSE hot exposure


TSE cold exposure

Short temperature recovery time

TSD: Less than 15 minutes for specimen temperature to recover in test between +150℃ and −65℃, plastic molded ICs 10kg as specimen.
TSE: Less than 5 minutes for upstream temperature to recover in test between +150℃ and −65℃.

Meets international standards

Designed to comply with major environmental test standards like MIL, IEC, JASO. (p.13～14)

Improved temperature uniformity

Uniform airflow in the test area allows outstanding temperature uniformity. Uniform thermal stress is applied to each specimen, minimizing variation in test results.

Smooth specimen transfer

"Soft move mode" is automatically activated when specimens move between the hot and cold chambers to reduce vibration and shock.

TSD

TSE

Test area anti-drop mechanism to protect specimens

The test area's drive unit is equipped with a braking device to prevent specimens from falling from the test area under any abnormal situations.

Comprehensive safety system

A double safety system ensures that any transfer between test areas stops automatically when the door is open, and that the door locks while transfer is in progress.

Features

Specimen Temperature Trigger (STT)

With up to two sensors attached to specimen(s), the STT function begins counting the exposure time once the specimen reaches a set temperature, or promptly activates moving of the specimen for the next exposure. This reduces overall testing time and ensures accurate specimen temperatures. Temperature readings can be recorded for each specimen and test area by connecting a temperature recorder. (TSD)

TSD Specimen temperature measurement
(Specimen temperature sensors Standard: 2 sensors
Optional: additional 3 sensors)

Easy wiring access

A cable port on right side allows for easy wiring for specimen measurement.

TSD Test areas (Top: hot chamber
Bottom: cold chamber)

Safe specimen handling thanks to ambient temperature recovery

The ambient temperature recovery feature intakes external air to return the test area to an ambient temperature after testing has finished or been paused. (TSD)

Double-lock door handle guarantees tight seal

Viewing window (option)

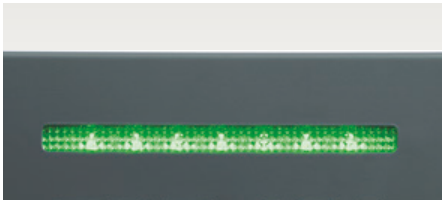
Optional viewing window with interior lighting allows checking on specimens and wiring during testing. (TSD)

TSD Viewing window (option)

Door handle

Operation lamp

The standard operation lamp indicates the chamber's status (in operation, on pause, or alert).



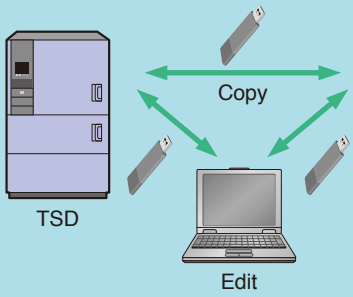
Operation lamp (in operation)

An easy-to-use, easy-to-read touch panel.

Slide label

Touching an icon displays the menu label.

Program copy and computer editing



* Some items may not be copied between different models and chambers with different options.

USB flash drive port

Tabbed interface

High resolution 7-inch LCD. Tabs at the bottom make for quick and easy flipping between screens. Touching an icon displays the menu label which, touched, makes flipping between screens easier.

Multilingual display

Use the language icon at the top of the display to change the display language from Japanese to English, Simplified Chinese, Traditional Chinese or Korean on any screen.

Quick access button

For added convenience, the star (★) icon can have quick access functionality assigned, such as for jumping to a certain screen or directly launching a saved test pattern.

Test data records

Temperature settings and measurements can be stored in the internal memory and exported with the use of USB flash drives. This enables them to be displayed as graphs on web browsers and stored for back-up purposes.
Test data can also be recorded in real time to a USB flash drive.
* USB flash drives not included.

Register up to 40 test patterns

Simple copying of program patterns between chambers

Program patterns can be copied between chambers without a computer, using USB flash drives.

Network

* Requires an intranet
* Supported browser: Internet Explorer 11

Remote monitor and control (Ethernet connection)

The chamber comes with an ESPEC original web application. Connecting to the chamber Ethernet port (LAN's port) makes it possible to control chamber monitoring, pattern setting, operation start/stop, and other operations from a computer web browser. Installation of special software is not required. All you need is a standard computer web browser to connect with the chamber.

Login privileges

Screen / Privileges	Chamber monitor	Pattern setting	Run/ Stop	Configuration
Administrator	✓	✓	✓	✓
Operator	✓	✓	✓	
User	✓			

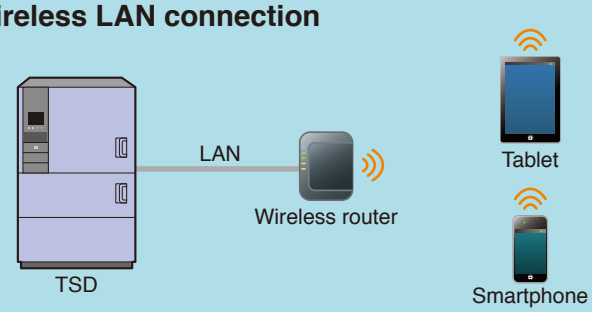
Edit test patterns on a web browser

Saved test programs can be edited on a web browser. Test programs can also be downloaded to your PC.

E-mail alert

Alerts such as for a test ending, for maintenance, and errors are e-mailed to multiple recipients.

Wireless LAN connection

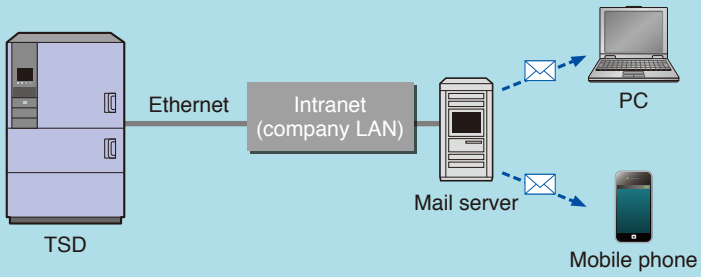


Watch the videos

▶ Remote ON/OFF Operation

▶ Connecting Easily with Ethernet (LAN)

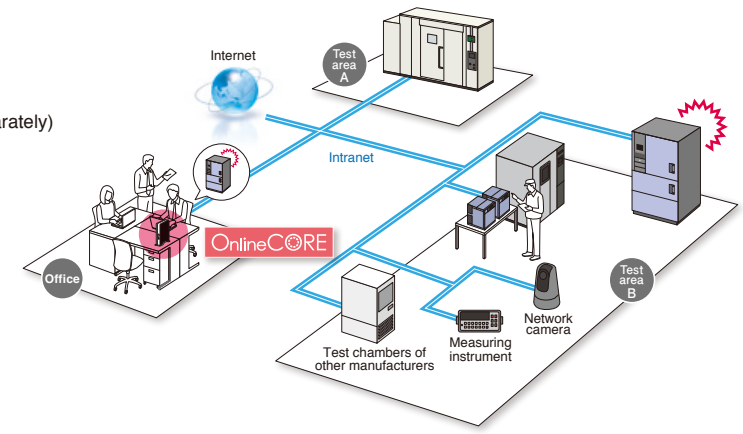
Email alert



ESPEC OnlineCore

OnlineCORE (Sold separately)

Central control system recommended for multiple environmental test chambers installations



*Please contact ESPEC for more information, about which products can be connected.

SPECIFICATIONS

Model			TSD-101-W				
System			2-zone transition by vertical transfer of specimens				
Performance *1	Test area	Hot exposure range	+60 to +205℃ (+140 to +401℉)				
		Cold exposure range	−77 to 0℃ (−106 to +32℉)				
		Temp. fluctuation *2	±1.0℃				
	Hot chamber	Pre-heat upper limit	+205℃				
		Heat-up time *3	Within 90 min. from ambient temp. to +200℃ (Setting: +205℃)				
	Cold chamber	Pre-cool lower limit	−77℃				
		Pull-down time *3	Within 90 min. from ambient temp. to −77℃ (Setting: −77℃)				
	Temp. recovery performance (2-zone)	Recovery conditions	2-zone ・Hot exposure: +150°C (setting: +155°C 30 min.) ・Cold exposure: −65°C (setting: −68°C 30 min.) ・Sensor position: downstream ・Specimen: Plastic molded ICs, 10kg				
		Temp. recovery time	Specimen IC temp. within 15 min.				
	Transfer time between hot & cold chambers		Within 10 seconds				
	Ambient recovery	Recovery conditions	・Hot exposure: +150℃ to max. +55℃ ・Ambient temp.: +23℃ ・Specimen: Plastic molded ICs, 10 kg				
		Ambient temp. recovery time	Within 90 min.				
Specimen baskets			Shelf brackets on 2 levels (up to 4 baskets can be installed)				
Door			Manually operated door with lock				
Refrigeration unit		System	Mechanical cascade refrigeration system (water-cooled condenser)				
		Refrigerator	Scroll-type compressor				
		Expansion mechanism	Electronic expansion valve				
		Refrigerant	R404A, R23				
Cooler			Plate fin cooler and cold accumulator				
Elevating unit			Power slider (250W)				
Fittings			USB flash drive port, Ethernet port (LAN port), specimen power supply control terminal, time signal output terminal (×2), specimen temperature input terminal (×2), cable port ID φ 100mm (×1) on right side (left side available as option), *Power cables are not included.				
Inside dimensions			W710×H345×D410 mm (W27.95×H13.58×D16.14 inch)				
Inner volume of test area			100 L				
Load capacity of test area *4			30 kg				
Outside dimensions *5			W1100×H1885×D1965 mm (W43.31×H74.21×D77.36 inch)				
Weight			Approx. 1100 kg				
Utility requirements	Ambient temp. range		+5 to +40℃ (+41 to +104℉)				
	Power supply (Voltage fluctuation: rating ±10%)		200V AC 3φ 50/60Hz	208V AC 3φ 60Hz *6	220V AC 3φ 60Hz	380V AC 3φ 50Hz	400/415V AC 3φ 50Hz *7
	Maximum load current		64 A	62 A	58 A	34 A	32 A
	Cooling water supply pressure *8		0.2 to 0.5 Mpa (2 to 5 kg/ cm^{2}G)				
	Cooling water supply rate *9		2050L/ h (at reference water temp. +25℃), 3400L/ h (at reference water temp. +32℃)				
	Piping connection size		Carbon steel pipe, ID 32 mm				
	Cooling water temp. range		+5 to +38℃ (+41 to +100℉)				
Noise level *10			Max. 65 dB				
Exhaust heat rate			12600 kJ/h (3000 kcal/h)				
Exhaust air volume			250 m^3/h				

*1 Under the conditions of a +23℃ ambient temperature, cooling water temperature +25℃, rated voltage, and no specimen inside the test area.
*2 The performance values are based on IEC 60068-3-5:2001,
*3 When each chamber is operated independently
*4 When using the test area floor or heavy-duty shelves (option)
*5 Excluding protrusions
*6 This model complies with the requirements of the National Electric Code (NFPA 70) for the United States of America (NEC spec.)
*7 This model complies with the requirements of the European Community Directives (CE spec.)
*8 A pressure regulator valve is required if the pressure exceeds 0.5MPa (5kg/cm^{2}G)
*9 Rate depends on the cleanliness of the heat exchanger
*10 Measurements are to be taken in an anechoic room at a height of 1.2m from the floor, and a distance of 1m from the front panel (ISO 1996-1: 2003.A-weighted sound pressure level)

International safety standard compliance Safety of Machinery (ISO 12100), Low Voltage (IEC 60204), EMC* (IEC 61000-6-2, IEC 61000-6-4).

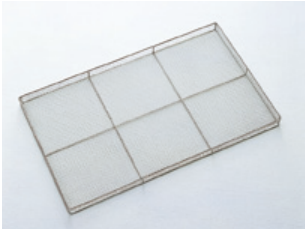
* For the CE-marked only.

SAFETY DEVICES

- Leakage breaker (200, 220V AC)
- Circuit breaker (208, 380, 400/415V AC)
- Electrical compartment door switch
- Hot chamber overheat protection switch
- Cold chamber overheat protection switch
- Hot chamber overheat protector
  (Built into temperature controller)
- Cold chamber overheat/ overcool protectors
  (Built into temperature controller)
- Test area overheat/ overcool protectors
  (Built into temperature controller)
- Test area overheat/ overcool protectors
- Circuit breaker
- Refrigerator high/ low pressure switch
- Compressor built-in protector
- Temperature switch for compressor
- Water suspension relay
- Temperature switch for air circulator
- Air circulator thermal relay
- Motor inverter
- Motor reverse prevention relay
- Hot chamber door switch
- Cold chamber door switch
- Door lock mechanisms
- Cartridge fuse
- Specimen power supply control terminal
- Cooling tower interlock terminal

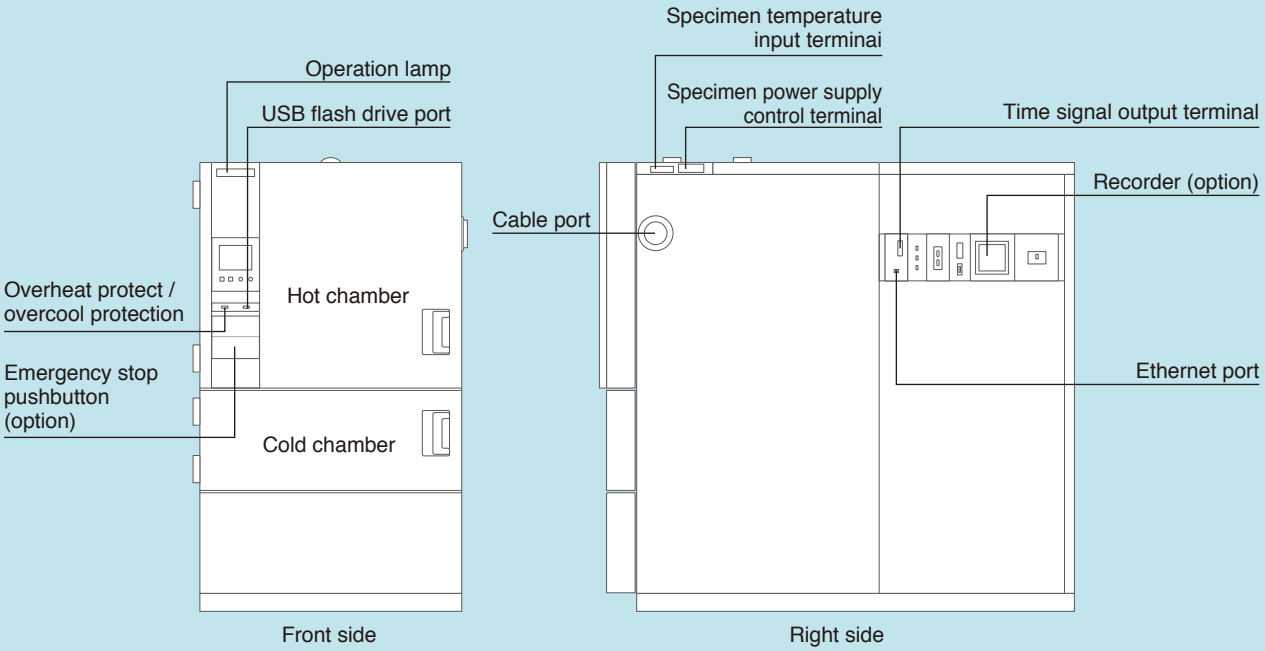
ACCESSORIES

- Specimen basket
  (18-8 Cr-Ni stainless steel: 5 mesh metal basket)
  W700×H40×D410 mm/ load capacity 5kg 2



- Shelf brackets ..... 2 sets
- Cartridge fuse (3A, 5A, 7A, 10A, 15A) 4
- Cable port rubber plug 2
- Perforated cable port cap 1
- Wire fisher (specimen wiring tool) 1
- Thermocouple 2
- Specimen temperature input connector 2
- 3-pole socket (208V AC spec. only) 3
- Nipple R1 1/4 in. (32 A) 1
- Strainer R1 1/4 in. (32 A) 1
- Strainer element R1 1/4 in. (32 A) 1
- Breaker handle cover (except 208V AC) 1
- Operation manual 1

Fittings location



SPECIFICATIONS

Model			TSE-12-A			
System			2-zone transition by vertical transfer of specimen			
Performance *1	Test area	Hot exposure range	+60 to +200℃ (+140 to +392℉)			
		Cold exposure range	−65 to 0℃ (−85 to +32℉)			
		Temperature fluctuation *2	±0.5℃			
	Hot chamber	Pre-heat upper limit	+205℃			
		Heat-up time *3	Within 30 min. from ambient temp. to +200℃ (Setting: +205℃)			
	Clod chamber	Pre-cool lower limit	−82℃			
		Pull-down time *3	Within 90 min. from ambient temp. to −80℃ (Setting: −82℃)			
	Temp. recovery	Recovery conditions	· 2 zones Hot exposure: +150℃, 30 min. Cold exposure: −65℃, 30 min. · Sensor position: Upstream · Specimen: Plastic molded ICs 2 kg			
		Temp. recovery time	Within 5 min.			
	Transfer time between hot & cold chambers		Within 10 seconds			
Construction	Specimen baskets		Shelf brackets on 2 levels of fixed location			
	Heater		Stripped wire heater			
	Refrigeration unit	System	Mechanical cascade refrigeration system			
		Compressor	Rotary 1.5 kW ×2			
		Refrigerant	R508A R404A			
		Condenser	Air-cooled condenser			
	Cooler		Plate fin cooler, cold accumulator			
Fittings			USB flash drive port, Ethernet port (LAN port), specimen power supply control terminal, time signal output terminal (2), cable port 50 mm, (right side), casters with leveling feet (4), power cable (approx. 2.5m)			
Specimen basket load capacity			2kg per basket (equally distributed load)			
Inside dimensions			W320×H148×D230mm (12.6×5.8×9 inch)			
Inner volume of test area			10.9 L			
Load capacity of test area			8 kg			
Outside dimensions *4			W680×H1745×D1050mm (26.8×64×41.3 inch)			
Weight			Approx. 400kg			
Utility requirements	Ambient temp. range		0 to +40℃ (+32 to +104℉)			
	Power supply (Voltage fluctuation: rating ±10%)		200V AC 3φ 3W 50/60Hz	220V AC 3φ 3W 60Hz	380V AC 3φ 4W 50Hz	400/415V AC 3φ 4W 50Hz *5
	Maximum load current		26A	25A	17A	17A
Noise level *6			60dB or less			
Exhaust heat rate *7			17,585kJ/h (4200 kcal/h)			

*1 The performance values are under the conditions of a +23℃ ambient temperature, relative humidity of 65%rh, rated voltage, and no specimen. Heat up time and pull down time are those of single-unit operation of each chamber.
*2 The performance values are based on IEC60068-3-5:2001.
*3 Temperature heat-up/pull-down time account for performance of each temperature chamber.
*4 Excluding protrusions.
*5 Compliance with CE Marking.
*6 At 1m from front of chamber, 1.2m from floor. (ISO 1996-1:2003 A-weighted sound pressure level) depending on environment
*7 At ambient temperature +23℃.

RoHS standard (EN 50581) | **International safety standard compliance**
Safety of Machinery (ISO 12100), Low Voltage (IEC 60204), EMC (IEC 61000-6-2, IEC 61000-6-4).

SAFETY DEVICES

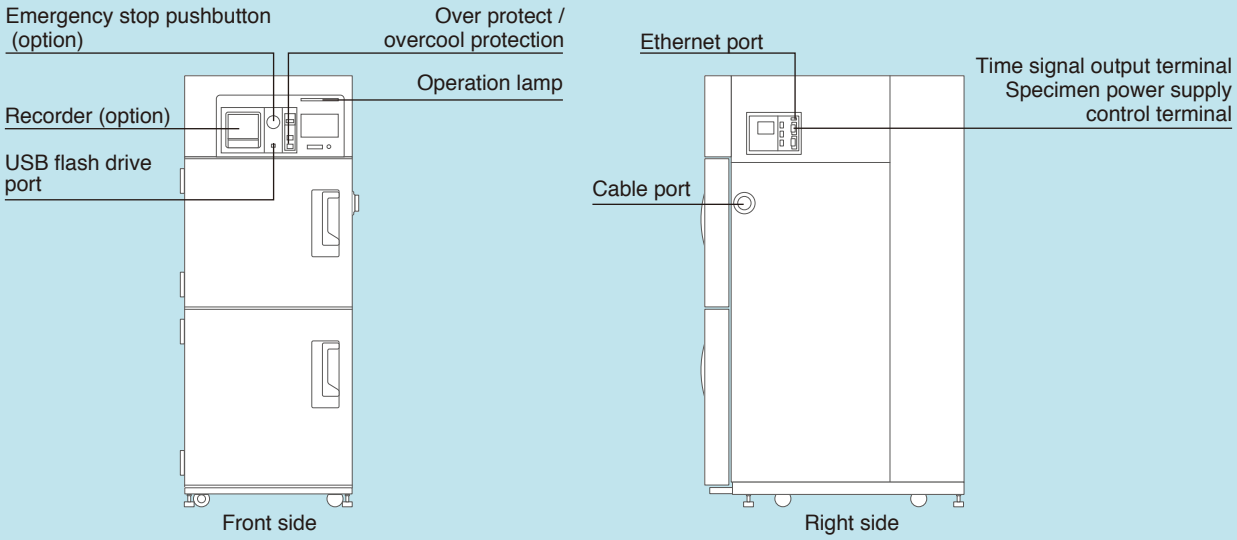
- Leakage breaker (200, 220V AC)
- Circuit breaker (380, 400 / 415V AC)
- Electrical compartment door switch
- Hot chamber overheat protection switch
- Cold chamber overheat protection switch
- Hot chamber overheat protector
  (Built into temperature controller)
- Cold chamber overheat / overcool protectors
  (Built into temperature controller)
- Test area overheat and overcool protectors
  (Built into temperature controller)
- Test area overheat / overcool protectors
- Refrigerator high pressure switch
- Thermal relay for compressor
- Temperature switch for compressor
- Temperature switch for air circulator
- Thermal relay for air circulator
- Motor inverter
- Motor reverse prevention relay
- Hot chamber door switch
- Cold chamber door switch
- Test area hold
- Door lock mechanisms
- Fuse
- Specimen power supply control terminal

ACCESSORIES

- Specimen basket
  (18-8 Cr-Ni stainless steel, 5 mesh metal basket)
  W320×H35×D230mm /load capacity: 2kg 2

- Cartridge fuse
  3A, 5A (200/220V AC) 1each
  3A, 5A,7A (380/400/415V AC) 1each
- Cable port rubber plug 2
- Wirefisher 1
- Breaker handle stopper (200/220V AC only)
- Operation manual 1

Fittings location



Safety precautions

- Do not use specimens which are explosive or inflammable, or which contain such substances. To do so could be hazardous, as this may lead to fire or explosion.
- Do not place corrosive materials in the chamber. If corrosive substances or humidifying water is used, the life of the unit may be significantly shortened.
- Do not place life forms or substances that exceed allowable heat generation.
- Be sure to read the operation manual before operation.

OPTIONS

Power cable

- 5 m
- 10 m

〈TSD〉

* Not applicable for optional 208, 380 and 400/415V AC power supply specification.
* If this option is not specified, the chamber does not come with a power cable.

Viewing window TSD

Used for observation of the specimens inside the chamber.
Dimensions: W190×H340 mm
Chamber lamp: Halogen lamp (×1)

Specimen basket/ shelf brackets

Equivalent to standard accessory.
Material: Stainless steel (5 mesh)

〈TSD〉
- Basket
- Shelf brackets

〈TSE〉
- Basket

Heavy-duty shelf TSD

Used to hold heavy specimen exceeding the load capacity of the standard specimen basket.
Load capacity: 15 kg

* Equally distributed load, not included shelf brackets and specimen baskets.

Additional cable port TSD

Provided in addition to the standard cable port. (right side)
Location: Left side of the main unit
Internal diameter: 100 mm

Cable port rubber plug

Prevents air leakage from the cable port.

Interface

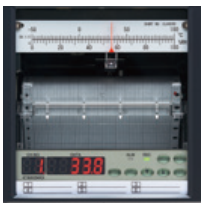
- RS-485C
- RS-232C
- GPIB

Communication cables

- RS-485C 5m/10m/30m
- GPIB 2m/4m

Temperature recorder (digital)

−100 to +220℃ /100 mm
- RK-61: 1 pen
- RK-63: 3 pens
- RK-64: 6 dots



Paperless recorder

Records temperature of each section such as the temperature inside the chamber.

Display: 5.7inch color touch panel
Number of inputs (Initial setting):
- 1 (5 more channels can be turned ON) Data saving cycle: 1 sec
- 3 (3 more channels can be turned ON) Data saving cycle: 1 sec
- 3 (3 more channels can be turned ON) Data saving cycle: 5 sec
- 5 (1 more channels can be turned ON) Data saving cycle: 1 sec
- 5 (1 more channels can be turned ON) Data saving cycle: 5 sec
- 6 Data saving cycle: 1 sec
- 6 Data saving cycle: 5 sec

Temperature range: −100 to +220℃
Internal memory: 8MB
External memory media:
CF memory card (256 MB)
External memory function: USB port
Language support: ENG/ JPN

* Select either built-in or portable type. (TSD)

Recorder wiring

Preparation of a power cable, temperature sensor, and a grounding wire for additional installation in the future.

Recorder terminal

Used to output the temperature within test area, hot chamber, cold chamber.

OPTIONS

Thermocouple

Attached to specimens to measure specimen temperature.

〈TSD〉
Thermocouple type T without ball
(Copper/ Copper-Nickel)

〈TSE〉
T JIS C1602 with ballattached
- 2 m
- 4 m
- 6 m

STT 3-point expansion TSD

Additional 3 points of measuring the specimens' temperatures used for Specimen Temperature Trigger function.
(2 points are equipped as standard.)

Exposure signal output TSD

A signal is output via a contact switch when test area temperature is within the user-selected range. This signal can be used to control peripheral instruments, like applying a voltage to specimens only during hot exposure, or monitoring test operation from a remote point.

Total cycle counter

Indicates cycle counts.
Display range: 1-99999999
(with resetting function)

Additional overheat protector

Additional preventive measures can be taken for excessive temperature rise in the chamber, in addition to the standard equipped double overheat protector.

Emergency stop pushbutton

Stops the chamber immediately.

With cover

With guard

Auxiliary cooling injector (LCO_2)

Used to reduce the temperature recovery time of low temperature exposure by injecting liquefied carbon dioxide at beginning of exposure.

Auxiliary cooling injector (LN_2)

Used to reduce the temperature recovery time of low temperature exposure by injecting liquefied nitrogen at beginning of exposure.

External alarm terminal

If the safety device of the chamber is activated, the external alarm terminal will notify it to a remote point.

TSD

Anchoring fixtures

Used to bolt the chamber to the floor.

Chamber dew tray

Prevents water leakage from the chamber onto the floor.
* The use of casters is recommended to facilitate operation. (TSD)
*To prevent damage in the event of water leakage, other preventive measures are also available.

Casters TSD

Installed for mobility.
Casters: 6
levelling-feet: 4

Operation manual

- CD
- Booklet

Reports & certificates

- Testing and inspection report
- Test data
- Calibration report
- Calibration certificate
- Traceability system chart
- Traceability certificate

■ Some photographs presented in this catalog contain Japanese display.

TEST STANDARD AND COMPATIBLE MODELS

Test standard		Temperature setting Hot (℃)	Temperature setting Cold (℃)	Soak time	Recovery time	Number of cycles	Model *
IEC 60068-2-14 (JIS C 60068-2-14 DIN EN 60068-2-14 BS EN 60068-2-14)		+70 ±2 +85 ±2 +100 ±2 +125 ±2 +155 ±2 +175 ±2 +200 ±2	−5 ±3 −10 ±3 −25 ±3 −40 ±3 −55 ±3 −65 ±3	3 hours 2 hours 1 hour 30 min. 10 min. 3 hours if not specified in product specifications	10% of soak time	5	TSD TSE
IEC 60749-25 (JESD22-A104-D)	A	+85(+10,−0)	−55(+0,−10)	1/ 5/ 10/ 15 min.	Specimen 5 to 14 min.	Not specified	TSD
	B	+125(+15,−0)	−55(+0,−10)		Specimen 5 to 14 min.		
	C	+150(+15,−0)	−65(+0,−10)		Specimen 5 to 29 min.		
	H	+150(+15,−0)	−55(+0,−10)		Specimen 5 to 14 min.		
	M	+150(+15,−0)	−40(+0,−10)		Specimen 5 to 15 min.		
IEC-61747-5 Na (EIAJ ED-2531A Na)		+100 ±2 +95 ±2 +90 ±2 +85 ±2 +80 ±2 +75 ±2 +70 ±2 +65 ±2 +60 ±2	−50 ±3 −45 ±3 −40 ±3 −35 ±3 −30 ±3 −25 ±3 −20 ±3 −15 ±3 −10 ±3 −5 ±3 −0 ±3	3 hours 2 hours 1 hour 30 min. 10 min. 3 hours if not specified in product specifications	10% of soak time	5·10	TSD TSE
EIAJ ED-4701		Max. storage temp.	Min. storage temp.	15g and below: at least 10 min. 15 to 150g: at least 30 min. 150 to 1,500g: at least 60 min. More than 1,500g: individually specified	Air 5 min. or 10% of soak time, whichever is longer	10	TSD
EIAJ ED-4702	A	+125(±3)	−65(±3)	30 min.	Air 5 min. or 10% of soak time, whichever is longer	5 cycles unless otherwise specified	TSD
	B	+100(±3)	−65(±3)				
	C	+100(±3)	−55(±3)				
	D	Mounted printed circuit board max. operating temp.	Mounted printed circuit board min. operating temp.				
EIAJ ET-7407	A	+125±5	−25±5	7 min. after specimen temperature attainment	———	———	TSD
	B	+125±5	−40±5				
	C	+80±5	−30±5				
	D	Max. operating temp.	Min. operating temp.				

TEST STANDARD AND COMPATIBLE MODELS

Test standard		Temperature setting		Soak time	Recovery time	Number of cycles	Model *
		Hot (℃)	Cold (℃)				
MIL-STD-883 Method 1010.8	A	+85(+10,−0)	−55(+0,−10)	10 min. or longer after transition start	Specimen less than 15 min.	At least 10	TSD TSE
	B	+125(+15,−0)	−55(+0,−10)				
	C	+150(+15,−0)	−65(+0,−10)				
	D	+200(+15,−0)	−65(+0,−10)				
	F	+175(+10,−0)	−65(+0,−10)				
JASO−D902	Type 1	+85	−40	Within 5 min. after solder joint temp. reaches ±2°C of preset temp. Or, 0.2kg and below: 0.5 hours 0.2 to 0.8kg: 1 hour 0.8 to 1.5kg: 1.5 hours More than 1.5kg: 2 hours preset temp.	Air 5 min.	200	TSD
	Type 2	Depends on parties involved					
IPC-TM-650 2.6.6	A	+125(+3,−0)	−65(+0,−5)	30 min.	———	5	TSD
	B	+85(+3,−0)	−55(+0,−5)				
SAE J1879		+150	−55	10 min. or longer after transition start	Specimen less than 15 min.	1000	TSD

* The test results may not meet specifications depending on the quantity of specimens or the setting method.
■ For futher information, please contactus.

ESPEC CORP. http://www.espec.co.jp/english

Head Office
3-5-6, Tenjinbashi, Kita-ku, Osaka 530-8550, Japan
Tel : 81-6-6358-4741 Fax : 81-6-6358-5500

ESPEC NORTH AMERICA, INC.
Tel : 1-616-896-6100 Fax : 1-616-896-6150

ESPEC EUROPE GmbH
Tel : 49-89-1893-9630 Fax : 49-89-1893-96379

ESPEC ENVIRONMENTAL EQUIPMENT (SHANGHAI) CO., LTD.
Head Office
Tel : 86-21-51036677 Fax : 86-21-63372237
BEIJING Branch
Tel : 86-10-64627025 Fax : 86-10-64627036
TIANJIN Branch
Tel : 86-22-26210366 Fax : 86-22-26282186
GUANGZHOU Branch
Tel : 86-20-83317826 Fax : 86-20-83317825
SHENZHEN Branch
Tel : 86-755-83674422 Fax : 86-755-83674228
SUZHOU Branch
Tel : 86-512-68028890 Fax : 86-512-68028860

ESPEC TEST TECHNOLOGY (SHANGHAI) CO., LTD.
Tel : 86-21-68798008 Fax : 86-21-68798088

ESPEC SOUTH EAST ASIA SDN. BHD.
Tel : 60-3-8945-1377 Fax : 60-3-8945-1287

ESPEC ENGINEERING (THAILAND) CO., LTD.
Tel : 66-0-3-810-9353 Fax : 66-0-3-810-9356

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UKAS MANAGEMENT SYSTEMS
051

ISO 9001/JIS Q 9001
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ISO 14001 (JIS Q 14001)
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